BAYOU PETITE ANSE TMDL FOR FECAL COLIFORM

SUBSEGMENT 060901

US EPA Region 6

With cooperation from the
Louisiana Department of Environmental Quality
Office of Environmental Assessment
Environmental Technology Division

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EXECUTIVE SUMMARY

Section 303(d) of the Federal Clean Water Act requires states to identify waterbodies that are not meeting water quality standards and to develop total maximum daily pollutant loads for those waterbodies. A total maximum daily load (TMDL) is the amount of a pollutant that a waterbody can assimilate without exceeding the established water quality standard for that pollutant. Through a TMDL, pollutant loads can be distributed or allocated to point sources and nonpoint sources discharging to the waterbody. A TMDL for the May – October season has been developed for fecal coliform bacteria for Bayou Petite Anse. Fecal coliform bacteria are monitored as the indicator for potential human health threats resulting from swimming.

Bayou Petite Anse flows from its headwaters to the confluence with Bayou Carlin (Estuarine). Bayou Petite Anse subsegment 060901 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for primary contact recreation (swimming). Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 400/100mL. These primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly: "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 2,000/100 mL."

One year (1998) of monthly LDEQ monitoring data on Bayou Petite Anse (collected at sampling site #0681) was assessed to determine if the primary and secondary contact recreation uses were being maintained. Analysis of the data for the November – April season shows that the secondary contact recreation use is being maintained (see Appendix A). Analysis of the data for the May – October season shows that the primary contact recreation use is not protected (see Appendix A). Therefore, a TMDL has been developed to protect the May – October season.

For the purpose of calculating current loading on Bayou Petite Anse the average fecal coliform concentration for the May – October season was calculated using monthly LDEQ monitoring data from sampling site #0681 in the Iberia Parrish. In Bayou Petite Anse, the monthly fecal coliform counts for this season range from 30 colony forming units (cfu)/100ml to 16,000 cfu/100ml over a 1-year period (1998).

For the purpose of TMDL development, the criterion of 200/100mL was applied. A fecal coliform loading curve for the recreational period (May 1 – October 31) has been generated as Figure 1. This loading curve was developed using Equation 1, substituting the criterion, 200

cfu/100 ml, for FC concentrations and varying flows. The attempt here is to show that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. A 77% reduction in fecal coliform loading during the May – October season will be needed to protect the primary contact recreation use.

1. **Introduction**

Bayou Petite Anse subsegment 060901 was listed on both the 1998 and the October 28, 1999 Court Ordered §303(d) Lists as not fully supporting the water quality standard for primary contact recreation (swimming). On the 1998 List, this segment was ranked as a high priority (1) for TMDL development. A TMDL for fecal coliform bacteria was developed in accordance with the requirements of Section 303 of the federal Clean Water Act. The purpose of a TMDL is to determine the pollutant loading that a waterbody can assimilate without exceeding the water quality standard for that pollutant; the TMDL also establishes the load reduction that is necessary to meet the standard in a waterbody. The TMDL consists of the wasteload allocation (WLA), the load allocation (LA), and a margin of safety (MOS). The wasteload allocation is the load allocated to point sources of the pollutant of concern, and the load allocation is the load allocated to nonpoint sources. The margin of safety is a percentage of the TMDL that accounts for the uncertainty associated with the model assumptions, data inadequacies, and future growth.

2. **Study Area Description**

2.1 General Information

Water quality subsegment 060901 is part of the Vermilion-Teche River Basin. The Basin encompasses the prairie region of the state and a section of the coastal zone. The Vermilion-Teche River Basin is bounded on the north by the Red River Basin, on the east by the Atchafalaya Basin, on the west by the Mermentau River Basin and southward by the Gulf of Mexico. The average annual rainfall in the vicinity of Bayou Petite Anse is approximately 60 inches. Land use in the Vermilion-Teche Basin is largely agriculture, the primary crops being corn, soybeans, and milo. The Alexandria urban area located to the north. Suburban communities have developed in the agricultural lands immediately south and west of Alexandria. The land use for the Vermilion-Teche River Basin is summarized in Table 1.

Table 1. Land Use (acres) in Segment 0609: Vermilion-Teche Basin

SEGMENT	AGRICULTURE	URBAN	WETLAND	FOREST
0609	142,921 (46.6%)	8,977 (2.9%)	140,468 (45.8%)	4,874 (1.6%)

2.2 Water Quality Standards

The designated uses for Bayou Petite Anse include both primary contact recreation and secondary contact recreation. Fecal coliform bacteria serve as the indicator used for the water quality criteria and for assessment of use support. Louisiana's water quality standard for protection of the primary contact recreation use reads as follows:

> "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 200/100mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the

> total samples collected annually exceed 400/100mL. These primary contact recreation criteria shall apply only during the defined recreational period of May 1 through October 31. During the non-recreational period of November 1 through April 30, the criteria for secondary contact recreation shall apply."

The standard for secondary contact recreation reads similarly: "Based on a minimum of not less than five samples taken over not more than a 30-day period, the fecal coliform content shall not exceed a log mean of 1,000/100 mL, nor shall more than 10 percent of the total samples during any 30-day period or 25 percent of the total samples collected annually exceed 2,000/100 mL."

2.3 Identification of Sources

The sources identified in the *1998 Louisiana Water Quality Inventory* as affecting the water quality of the Vermilion River are unknown sources.

Point Sources

Searches were made of the EPA Permit Compliance System (PCS) database and the LDEQ permit database to identify facilities that discharge to this segment. Through this process, EPA has identified 25 facilities discharging sanitary wastewater into Bayou Petite Anse. The combined flow of all these discharges is 14,620,000 gallons per day (see Appendix B for list of all possible dischargers).

Nonpoint Sources

The predominant land uses in the Bayou Petite Anse watershed are agriculture and forestry, both of which contribute to fecal coliform loads through runoff.

3.0 **TMDL Load Calculations**

3.1 Current Load Evaluation

Fecal coliform loads have been calculated using the instream bacterial counts and the flow of the stream. The following equation can be used to calculate fecal coliform loads.

Equation 1. C x 1000mL/ L x 1 L/0.264 gallons x Q in gallons/day = cfu/day

Where: C = colony forming units/100mL
Q = stream flow in gallons/day

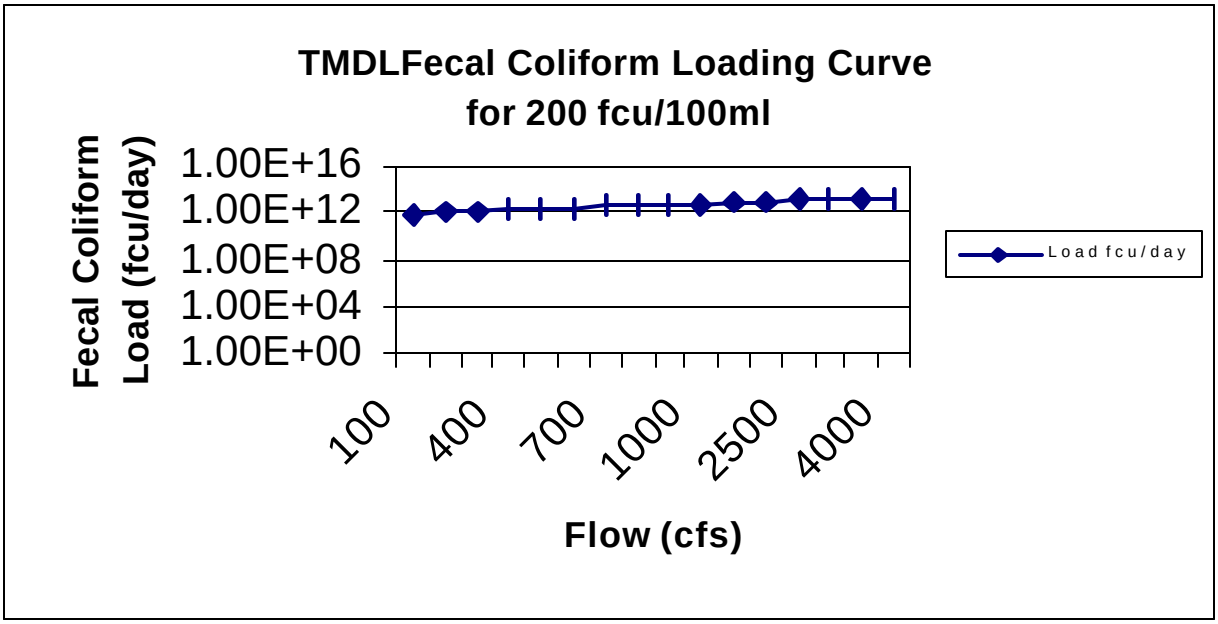
A traditional expression of the FC loading may be developed by setting one critical or representative flow and concentration, and calculating the fecal coliform load using Equation 1. The difficulty with this approach is in the determination of the appropriate flow or concentration value to use. For the purpose of calculating current loading on the this waterbody the average fecal coliform concentration for the May-October season was calculated using monthly LDEQ monitoring data from sampling site #0681. In Bayou Petite Anse, the monthly fecal coliform counts for this season ranged from 30 colony forming units (cfu)/100mL to 16,000 cfu/100mL

over a 1-year period (1998). The average fecal coliform count for the May – October season is 881 cfu/100ml (see Appendix A). In addition, the estimated average flow for Bayou Petite Anse for the May – October season is 341.48 ft^3/sec (see Appendix C). Using these values and Equation 1 it is estimated that the current loading for the May – October season is 7.37 E12 cfu/day.

3.2 TMDL

Point sources usually have a defined critical receiving stream low flow such as the 7Q10 at which the criterion must be met. For nonpoint sources it is recognized that there may be no single critical flow condition. To address this condition, a TMDL fecal coliform loading curve for the recreational period (May 1 – October 31) has been generated as Figure 1. This TMDL loading curve was developed using Equation 1, substituting the criteria, 200 cfu/100 ml, for FC concentrations and varying flows. The attempt here is to show that while a TMDL may be expressed as a single point it can also be thought of as a continuum of points representing the criterion value and various flow values. This curve is not stream dependent but is dependent upon the designated stream criterion. Therefore, it may be applied to any stream with a like FC criterion. This curve represents the TMDL loading allocation for FC.

Figure 1. TMDL Fecal Coliform Loading Curve for the May – October season.



Utilizing Figure 1 one can select a stream flow and can quickly determine the FC loading value. The line formed by this series of points may be thought of as a boundary. At any given flow the loading may be below the line, within the boundary, or above the line. FC load values falling above the line represent disproportionately high values relative to the standard. FC load values falling below the line represent low loads relative to the standard. To develop load reductions one simply needs to determine the appropriate flow value (x-axis) and see where it intersects the load allocation line.

The load reduction needed to meet the water quality standard for primary contact recreation in Bayou Petite Anse at 341.48 cfs is 5.70 E12 cfu/day (77% reduction). This was obtained by calculating the allowable TMDL at 341.48 cfs for the 200 cfu/100ml criterion (1.67 E12 cfu/day) and subtracting this load from the observed load (7.37 E12 cfu/day, see Appendix A).

Current Load - TMDL = Load Reduction

7.37 E12 cfu/day – 1.67 E12 cfu/day = 5.70 E12 cfu/day

3.3 Wasteload Allocation (WLA)

The Louisiana Water Quality Regulations require permitted point source discharges of treated sanitary wastewater to maintain a fecal coliform count of 200 cfu/100 mL in their effluent, i.e., they must meet the standard at end-of-pipe. Therefore, there will be no change in the permit requirements based upon a wasteload allocation resulting from this TMDL.

Equation 1 can be used to calculate the total point source load (wasteload allocation) utilizing a fecal coliform count of 200 cfu/100 mL and the total volume of all the wastewater dischargers (14,620,000 gallons/day).

200 cfu/100mL * 1000mL/L * 1 L/0.264 gallons * Q gallons/day = WLA

Where Q = Total volume of sanitary wastewater discharges into Bayou Petite Anse

WLA for all dischargers = 1.11 E11 cfu/day

3.4 Load Allocation (LA)

The load allocation for each season for a given flow can be calculated using Equation 1 and the following relationship:

(TMDL@ given flow and criterion) - (WLA)= LA

LA for May – October season at an instream flow of 341.48 cfs = 1.56 E12 cfu/day

1.67 E12 cfu/day (TMDL@ 341.48 cfs) – 1.11 E11 cfu/day (WLA) = 1.56 E12 cfu/day

3.5 Seasonal Variability

Louisiana has established a seasonal water quality standard for bacteria based upon definition of a summer swimming season and winter secondary contact only. In development of this TMDL data for all seasons were evaluated and it was determined that a TMDL for the May - October season was needed to protect the primary contact recreation use.

3.6 Margin of Safety (MOS)

The Clean Water Act requires that TMDLs take into consideration a margin of safety. EPA guidance allows for the use of implicit or explicit expressions of the margin of safety or both. When conservative assumptions are used in the development of the TMDL or conservative factors are used in the calculations, the margin of safety is implicit. When a percentage of the load is factored into the TMDL calculation as a margin of safety, the margin of safety is explicit. In this TMDL for fecal coliform, conservative assumptions have been used and therefore, the margin of safety is implicit. These conservative assumptions are:

- Using average seasonal flows to calculate current loading to obtain load reduction.
- Treating fecal coliform bacteria as a conservative pollutant, that is, a pollutant that does not degrade in the environment (bacteria do die off in the environment)
- Using the more conservative 200 cfu/100mL standard rather than 400 cfu/100mL for the summer primary contact recreational season and 1,000 cfu/100mL rather than 2,000 cfu/100mL for the winter season.
- Using the design flow of the point source dischargers rather than actual average flow rates, which are typically much lower

4 Other Relevant Information

Utilizing funds under Section 106 of the federal Clean Water Act and under the authority of the Louisiana Environmental Quality Act, the LDEQ has established a program for monitoring the quality of the state's surface waters. The LDEQ Surveillance Section collects surface water samples at various locations, utilizing appropriate sampling methods and procedures for ensuring the quality of the data collected. The objectives of the surface-water monitoring program are to determine the quality of the state's surface waters, to develop a long-term database for water quality trend analysis, and to monitor the effectiveness of pollution controls. The data obtained through the surface-water monitoring program is used to develop the state's biennial 305(b) report (*Water Quality Inventory*) and the 303(d) list of impaired waters. This information is also utilized in establishing priorities for the LDEQ nonpoint source program.

The LDEQ has implemented a watershed approach to surface water quality monitoring. Through this approach, the entire state is sampled over a five-year cycle with two targeted basins sampled each year. Long-term trend monitoring sites at various locations on the larger rivers and Lake Pontchartrain are sampled throughout the five-year cycle. Sampling is conducted on a monthly basis or more frequently if necessary to yield at least 12 samples per site each year. Sampling sites are located where they are considered to be representative of the waterbody. Under the current monitoring schedule, targeted basins follow the TMDL priorities. In this manner, the first TMDLs will have been implemented by the time the first priority basins will be monitored again in the second five-year cycle. This will allow the LDEQ to determine whether there has been any improvement in water quality following implementation of the TMDLs. As the monitoring results are evaluated at the end of each year, waterbodies may be added to or removed from the 303(d) list. The sampling schedule for the first five-year cycle is shown below. The Vermilion-Teche River Basin will be sampled again in 2003.

1998 – Mermentau and Vermilion-Teche River Basins

1999 - Calcasieu and Ouachita River Basins
2000 – Barataria and Terrebonne Basins
2001 – Lake Pontchartrain Basin and Pearl River Basin
2002 – Red and Sabine River Basins

(Atchafalaya and Mississippi Rivers will be sampled continuously.)

In addition to ambient water quality sampling in the priority basins, the LDEQ has increased compliance monitoring in those basins, following the same schedule. Approximately 1,000 to 1,100 permitted facilities in the priority basins were targeted for inspections. The goal set by LDEQ was to inspect all of those facilities on the list and to sample 1/3 of the minors and 1/3 of the majors. During 1998, 476 compliance evaluation inspections and 165 compliance-sampling inspections were conducted throughout the Mermentau and Vermilion-Teche River Basins.

5 Public Participation

When EPA establishes a TMDL, 40 C.F.R. § 130.7(d)(2) requires EPA to publicly notice and seek comment concerning the TMDL. Pursuant to an October 1, 1999, Court Order, EPA prepared this TMDL. After submission of this TMDL to the Court, EPA will commence preparation of a notice seeking comments, information and data from the general and affected public. If comments, data or information are submitted during the public comment period, then the Court Ordered TMDL may be revised accordingly. After considering public comment, information and data, and making any appropriate revisions, EPA will transmit the revised TMDL to the Court, and to the Louisiana Department of Environmental Quality (LDEQ) for incorporation into LDEQ's current water quality management plan.

REFERENCES

Center for Louisiana Inland Water Studies. *A Model of Loading, Transport, and Fate of Coliform bacteria in the Big Creek Watershed, Tangipahoa Parish, Louisiana*. University of Southwestern Louisiana, Civil Engineering Department. Report Number CLIWS-WQR 93.11. Lafayette, 1993.

Louisiana Department of Environmental Quality. *State of Louisiana Water Quality Management Plan, Volume 4: Boundaries and Inventories*. Louisiana Department of Environmental Quality, Office of Water Resources, Baton Rouge, 1987.

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APPENDIX A

Fecal Coliform data and loading calculations for each season.

Bayou Petite Anse

This data last updated on: 08/06/00

DATE	TIME		FECAL COLIFORM MPN/100ML
12/09/98	1125		500
11/24/98	1040	L	16000
10/28/98	1233		170
10/14/98	1138		700
09/23/98	0945		280
09/09/98	1000		300
08/26/98	1020		600
08/12/98	1035		30
07/29/98	1000		350
07/15/98	1030		5000
06/24/98	0845		500

Primary Contaact recreation Standard was exceeded 44% (4 of 9 samples) from May 1 to October 31 and 55% (6 of 11 samples) annually.

	Flow (cfs)	Flow (gal/day)	Fecal Count (cfu/100mL)	Load (cfu/day)
Current Load	341.48	220,700,000	881	7.37 E12
Allowable Load	341.48	220,700,000	200	1.67 E12
Load Reduction				5.70 E12 or 77%

APPENDIX B

Dischargers in subsegment.

Subsegment 060901- Bayou Petite Anse

Facility Name	Permit Number	Receiving Waterbody Name	Flowrate (MGD)	Comments
Cobb Directional Drilling, Inc.	LA0096687	Bayou Parc Perdu	0.000015	Known
Anadrill/Schlumberger, Inc.	LA0083739	Bayou Parc Perdu to Anselm Coulee to Vermilion River	1	Estimated
Mud Motors, Inc.	LA0109509	LaSalle Coulee to Bayou Parc Perdu	0.0005	Estimated
Village of Youngsville	LA0055328	Bayou Parc Perdu	0.194	Known
Mcilheany Co.	LA006858	Bayou Petit Anse	1	Estimated
Cargill, Inc.	LA0000264	Avery Island Canal	6.192	Known
Exxon Corp.	LA0089338	Canal to Bayou Petite Anse	0.0005	Known
Unknown	LA0112151	LaSalle Coulee to Bayou Parc Perdu	1	Estimated
Turner Well Service	LA0086835	LaSalle Coulee to Bayou Parc Perdu	1	Estimated
Unknown	LA0111121	LaSalle Coulee to Bayou Parc Perdu	1	Estimated
Nance and Collums, Inc.	LA0070874	Bayou Petite Anse	0.000225	Known
Iberia Oilfield Computer	LA0089621	Bayou Petite Anse	0.0005	Estimated

United Diesel, Inc.	LA0089044	Ditch to Armenco Branch Canal to Bayou Petite Anse to Avery Canal to Vermilion Bay	0.000698	Known
Quail Tools, Inc.	LA0106313	Armenco Branch Canal to Bayou Petite Anse	1	Estimated
Pellerin's Tubular	LA0109401	Armenco Branch Canal to Bayou Petite Anse	1	Estimated
Austin Boar Rentals	LA0007323	Delcambre Canal (Bayou Carlin)	1	Estimated
Best Deal Seafood, Inc.	LA0052817	Delcambre Canal (Bayou Carlin)	0.009999	Known
Best Deal Seafood, Inc.	LA0052825	Delcambre Canal (Bayou Carlin)	0.009999	Known
Delcambre Seafood Market, Inc.	LA0052957	Delcambre Canal (Bayou Carlin)	0.009999	Known
Southwest Pass Seafood	LA0053066	Delcambre Canal (Bayou Carlin)	0.009999	Known
Sims Brothers Seafood Co.	LA0078336	Delcambre Canal (Bayou Carlin)	0.04	Estimated
Vinet Shrimp, Inc.	LA0097811	Delcambre Canal (Bayou Carlin)	0.04	Estimated
Bayou Seafood Processing Co.	LA0097438	Delcambre Canal (Bayou Carlin)	0.04	Estimated
Acadian Treatment Ssytems, Inc.	LA0074888	Ditch to Bayou Parc Perdu	0.035	Estimated
Ocean Pride Seafood, Inc.	LA0095079	Delcambre Canal (Bayou Carlin)	0.04	Known

			Total = 14.62	

APPENDIX C

Flow calculation methodology.

January 27, 2000

DETERMINATIONS OF AVERAGE STREAMFLOW FOR SELECTED LADEQ WATER QUALITY STATIONS IN LOUISIANA.

Note: *The* "average streamflow" is defined to be the annual average streamflow.

Bayou Des Cannes northeast of Jennings (DEQ # 0308 and 0647) - Based on the runoff for the USGS station on Bayou Des Cannes near Eunice, 2.11 CFS per square mile, and a drainage area for the 308 site of 368.69 square miles, the average strearnflow is estimated to be 778 CFS. . The May - October average flow is estimated to be about 73% of the annual average flow; the Novcmber - April average flow is estimated to be about 127 % of the annual average flow.

Bayou Nezpique at La. 104 north of Basile (DEQ 005) -- Based on the runoff for the USGS station on Bayou Nezpique near Basile, 1.89 CFS per square mile, and a drainage area for the 005 site of 327.62 square miles, the average streamflow is estimated to be 619 CFS. . The May - October average flow is estimated to be about 47% of the annual average flow**;** the November - April average flow is estimated to be about 153 % of the annual average flow.

Bayou Nezpique at La. 97 near Jennings (DEQ 309) -- Based on the runoff for the USGS station on Bayou Nezpique near Basile, 1.89 CPS per square mile, and a drainage area for the 309 site of 580 square miles, the average streamflow is estimated to be 1,096 CFS. The May - October average flow is estimated to be about 47**%** of the annual average flow-, the November - April average flow is estimated to be about 153 % of the annual average flow.

Bayou Nezpique at boat landing near Jennings (DEQ 651) - Based on the runoff for the USGS station on Bayou Nezpique near Basile, 1.89 CFS per square mile, and a drainage area for the 651 site of 585 square miles, the average streamflow is estimated to be 1, 106 CFS. The May - October average flow is estimated to be about 47**%** of the annual average flow; the November - April average flow is estimated to be about 153 % of the annual average flow.

Bayou Plaquemine Brule at Refinery (DEQ 650) - Based on the runoff for the USGS station on Bayou Des Cannes near Eunice (best available estimator), 2.11 CFS per square mile, and a drainage area for the 650 site of 331.87 square miles, the average streamflow is estimated to be 700 CFS. The May - October average flow is estimated to be about 73% of the annual average flow; the November - April average flow is estimated to be about 127 % of the annual average flow.

Bayou Boeuf at mouth (DEQ 668) - Based an the runoff for the USGS station an Bayou Courtableau near Washington, 1.56 CPS per square mile, and a drainage area for the 668 site of 234.33 square miles, the average streamflow is estimated to be 312 CFS. The May - October average flow is estimated to be about 53% of the annual average flow; the November - April average flow is estimated to be about 147% of the annual average flow.

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Bayou Teche at Breaux Bridge (DEQ 03 1) -- Based on the adjusted runoff for the USGS station on Bayou Teche at Arnaudville and a subtraction of the estimated average flow for Bayou Fusilier, the estimated average streamflow is 760 CFS. The May - October average flow is estimated to be about 76% of the annual average flow; the November - April average flow is estimated to be about 124 % of the annual average flow.

Bayou Teche at Adeline (DEQ 030) – With the assumption that the average streamflow for the USGS station on Bayou Teche at Keystone Lock and Dam is the same as the average streamflow at Adeline, the estimated average streamflow for Site DEQ 030 is 491 CFS. The May-October average flow is estimated to be about 78% of the annual average flow; the November-April average flow is estimated to be about 122% of the annual average flow.

Vermilion River at Perry (DEQ 001) – Based on DEQ determinations for Vermilion River at Surrey Street in Lafayette using USGS data for the period 94-97, the average flow for the Vermilion River at Perry is about 750 CFS. For May-October, the average flow is estimated to be about 600 CFS; for November- April, the average flow is estimated to be about 900 CFS.